REGIONAL INTERIM PROJECT WATER QUALITY MANAGEMENT PLAN GREAT FALLS, MONTANA

Prepared by

Montana State Department of Health
and Environmental Sciences

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Certified by:

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Approved by:

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INTRODUCTION

For the immediate period, the objectives of this water quality management plan are:

1. To assure with an acceptable level of certainty that water quality standards implementation plans will achieve instream goals, and,

2. To maximize the cost effectiveness of investments in pollution abatement and preventive actions required to achieve water quality objectives.

The long-range objectives are to improve water quality where it is already degraded and to protect existing high water quality where it is already present.

Six documents provide the principal information for this water quality management plan. These are:

1. "1990 Great Falls Area Comprehensive Plan", Small, Cooley and Associates, Inc., 1970 (Appendix A)

2. "Areawide Sanitary and Storm Sewerage Facilities Plan for Great Falls Planning Area, Great Falls, Montana", Black & Veatch, 1972 (Appendix B)

3. "Design Report Improvements to Wastewater Treatment Facilities, Great Falls, Montana", Black & Veatch 1970 (Appendix C)

4. "Basis of Design Memorandum, Great Falls Sewage Treatment Improvements", Black & Veatch, March 15, 1972 (Appendix D)

5. "Waste Solids Handling and Disposal Processes", Black & Veatch letter dated June 21, 1971 (Appendix E)

6. "Water Pollution Control in Cascade County", State Department of Health and Environmental Sciences, December 1972 (Appendix F).

Description of Land Use

A description of existing land use and the proposed land use is described in the 1990 Great Falls Area Comprehensive Plan prepared by Small, Cooley and Associates, Inc. (Appendix A). The population within the Great Falls City-County jurisdictional boundary was estimated at 77,179 in 1968 and the plan predicted a population of 120,357 by 1990. It estimated that more than one-half of this increase will take place south of Tenth Avenue South and the Sun River. Other major increases are expected in the Riverview area and to the east between the present city limits and Malmstrom Air Force Base.

Hydrology and Stream Classifications

Two principal drainages are located within the planning area. (See Figures 1 & 2). These are the Missouri River and the Sun River. There is a gaging station on the Sun River near Vaughn, Montana about 15 miles above the confluence with the Missouri River. The maximum discharge on record was 53,500 cubic feet per second on

April 24, 1944 and the average discharge for 36 years of record was 730 cubic feet per second. The nearest gaging station below Great Falls on the Missouri River is located at Morony Dam on the Missouri River, 12.6 miles northeast of Great Falls. The maximum flow recorded was 72,000 cubic feet per second on June 10, 1964. The minimum daily flow on record was 1,760 cubic feet per second on April 16, 1961. The average discharge for a 14-year period was 7,483 cubic feet per second. The Missouri River above Great Falls can best be described as a stream which flows relatively clear during most of the year and somewhat productive from the biological standpoint. The flow in the Missouri River at this point is well regulated by Canyon Ferry, a Bureau of Reclamation Dam, which is located about 50 miles above Great Falls.

Sun River in the Great Falls area can best be described as a stream carrying large amounts of turbidity during the period beginning with spring runoff and ending when irrigation waters are shut off. The major source of turbidity is from Muddy Creek near Vaughn, a creek which receives irrigation return flows. The creek is not capable of carrying these high flows from the erosion standpoint.

The flow of the Missouri River is further controlled in the Great Falls area by Black Eagle, Rainbow and Morony Dams which are Montana Power Company dams for power generation with small storage capabilities. These act as a means of settling turbidity that is present mainly from the Sun River.

A minor drainage in this area is Sandcoulee Creek which enters the Missouri River about three miles above the confluence of the Missouri and Sun River. Sandcoulee Creek carries great quantities of acid mine drainage. This is further described in "Water Pollution Control in Cascade County" (Appendix F); however, only a very small amount of metals actually enters the Missouri River as little of this flow reaches the Missouri River except during high water.

Classification of streams is shown on Figure 3 and is further discussed in Appendix F.

Sanitary and Storm Sewers

Sanitary and storm sewers are for the most part separate systems. The principal area of interconnection is in the Third and Sixth Street North area. It is planned to separate the storm and sanitary sewers during 1975. There are areas where groundwater enters the sewerage system. The city has a television camera to locate sewers which need to be repaired or replaced. Some areas of high infiltration have been located, and these are scheduled for repair or replacement. Additional television work needs to be done and it is recommended that this be completed at an early date.

A summary of costs taken from the Black and Veatch Areawide Sanitary and Storm Sewerage Facilities plan is shown below:

	First Stage* $ million	Second Stage** $ million	Total $ million
Sanitary sewerage facilities	9.746	3.128	12.874
Storm sewerage facilities	5.791	6.480	12.271
Sewer separation	0.941	-	0.941
TOTAL	16.478	9.608	26.086

* Estimated costs for first stage reflect inflationary increases
** Based on January 1, 1973 prices

Wastewater Treatment

Wastewaters entering the Missouri River are described in "Water Pollution Control in Cascade County" (Appendix F). The principal source of wastewater needing additional treatment in the Great Falls area is from the City of Great Falls system itself. (Refer to Appendix F). The city presently has a primary treatment facility utilizing effluent chlorination. Both the primary and chlorination facilities are at times overloaded. Sludge banks are prevalent below the outfall and high coliform counts have been recorded by the State Department of Health. The Montana Water Pollution Control Council at the recommendation of the Water Pollution Control Administration placed the City of Great Falls on a compliance schedule for secondary treatment in 1967. The compliance schedule was as follows:

Submittal of preliminary engineering report by January 1, 1970
Arrangement of financing by July 1, 1970
Completion of design by January 1, 1971
Start of construction by July 1, 1971
Completion of construction by July 1, 1972.

Because of invalidation of Montana's bonding laws which were corrected by the 1971 legislature, the schedule was changed as follows:

Arrangement of financing by November 1, 1971
Completion of design by January 1, 1972
Start of construction by April 1, 1972
Completion of construction by January 1, 1974.

To date, one contract (upgrading of the primary facilities) has been let. Further contracts are awaiting the award of Federal grants and the City will proceed with the additional contracts as soon as these funds become available. The City passed their bond issue during September of 1972 for their share of the project costs. A description of the remaining contracts is given below:

Contract #2

Purchase solids processing equipment - $1,250,000

Contract #3

1. Secondary treatment basin complex consisting of aeration basins, final settling basins, chlorine contract basins and non-potable water supply pump station.

2. Waste activated sludge thickners (flotation). Estimated cost - $6,670,000

Contract #4

1. Modifications to existing digesters including modification of primary digester to thickened sludge holding tank, modification of secondary digester to side stream holding tank to administration/personnel building and control building.
2. Solids processing building.
3. Decant tanks (heat treated sludge).
4. Heat treated sludge and scum pump station.
5. Modification to existing chlorine building.
6. New chlorine storage facilities.
7. Site and yard work.

Estimated costs - $3,220,000.

The present site was selected because it was the only low level site available in the area. It is capable of serving the area for the design period. Activated sludge treatment was selected because of the State Department of Health's request for an average BOD removal of 90 percent and minimum removal at any time of 85 percent. Trickling filters would not meet this requirement at all times.

An alternate exists on the actual disposal point into the Missouri River as the effluent could be piped to a downstream point such as below Black Eagle dam. However, this could be done at any time.

Various means of sludge handling were investigated and these are summarized in Appendix E. Sludge heat treatment followed by vacuum filtration was selected as the best method by the consulting engineer.

"Basis of Design Memorandum" (Appendix D) provides design data. The plant is being designed for a population of 120,000, an average flow of 20 million gallons per day, a total maximum flow of 42 million gallons per day and a short term peak of 60 million gallons per day, a BOD of 0.25 pounds per capita per day, a suspended solids of 0.25 pounds per capita per day and a minimum removal efficiency of BOD and suspended solids of 90 percent. An average BOD of 3,000 pounds per day and suspended solids of 3,000 pounds per day will be present in the effluent at design loadings.

A priority certification for contract #2 should be issued by the State Department of Health during December of 1972 and for contract #3 on or soon after July 1, 1973. If no additional federal funds are released for Fiscal Year 1973 and 1974, Contract #4 will not be started until after July 1, 1974, which will throw the city considerably behind schedule. This would also place anticipated construction of sanitary sewers and storm sewers considerably behind schedule.

Itemized below is the number and type of operation and maintenance employees estimated to be required to staff the completed facility.

Superintendent - 1
Assistant Superintendent - 1
Clerical - 1
Shift Foreman - 2
Operator II - 9
Operator I - 10
Automotive Equipment Operator - 4
Maintenance Mechanic II - 2
Maintenance Mechanic I - 1
Electrician II - 1
Maintenance Helper - 2
Laborors - 4
Custodian - 1
Chemist - 1
Laboratory Technician - 2
Total - 42

Estimated operation and maintenance costs for the completed facility are tabulated as follows:

Labor - $353,800
Power - $54,200
Chemicals - $24,800
Other materials and supplies - $64,400
Total - $497,200

Sewage Treatment Effluent and Missouri River Water Quality

The proposed treatment should produce a final wastewater with the following concentrations of various constituents:

Estimated
Sewage Influent and Effluent
at 1990 Design

	Influent #/day	Effluent #/day
BOD	30,000	3,000
SS	30,000	3,000
PO_4	1,200	600
Fecal Coliform /100 ml.	30,000,000	Less than 1,000

Based on these concentrations, the following increases will be present in the Missouri River from this discharge:

Concentrations in Missouri River
Due to Sewage Discharge

	At Average Flow 7,483 cfs	At minimum flow 1,760cfs
BOD (mg/l)	0.07	0.3
SS (mg/l)	0.07	0.3
PO_4 (mg/l)	0.01	0.06
Fecal Coliforms /100 ml.	5	22

Considering the above BOD value at minimum flow and even without consideration of re-aeration in the stream, a maximum decrease of oxygen of 0.3 milligrams per liter could be expected in the Missouri River due to the City of Great Falls discharge. There will be some increased fertilizing effect on the stream due to the BOD and nutrients present, but this is not expected to interfere with the present classified uses of the stream as this effect will probably be minimal. The fecal coliform content in the river below Great Falls should be greatly decreased. The content presently found at Fort Benton is probably due in large part to the City of Great Falls discharge.

Water quality in the Missouri River is determined by U.S.G.S. sampling and analysis through contract with EPA is as follows:

Missouri River at Fort Benton
(EPA Station with Data Provided by USGS)

	Mean	Maximum	Period of Record
BOD (mg/l)	1.79	5.3	July, 1969 to August, 1971
DO (mg/l)	10.56	8.00 (min.)	"
PO_4 (total-mg/l)	0.13	0.42	"
Fecal Coliform/100 ml.	291	750	Aug., 1970 to Aug. 1971

About the only thing out of ordinary at this station is a relatively high arsenic. This runs close to the recommended maximum of 0.01 milligrams per liter as published in the U. S. Public Health Service Drinking Water Standards. This is a reflection of the high arsenic concentration in the Madison River leaving Yellowstone Park.

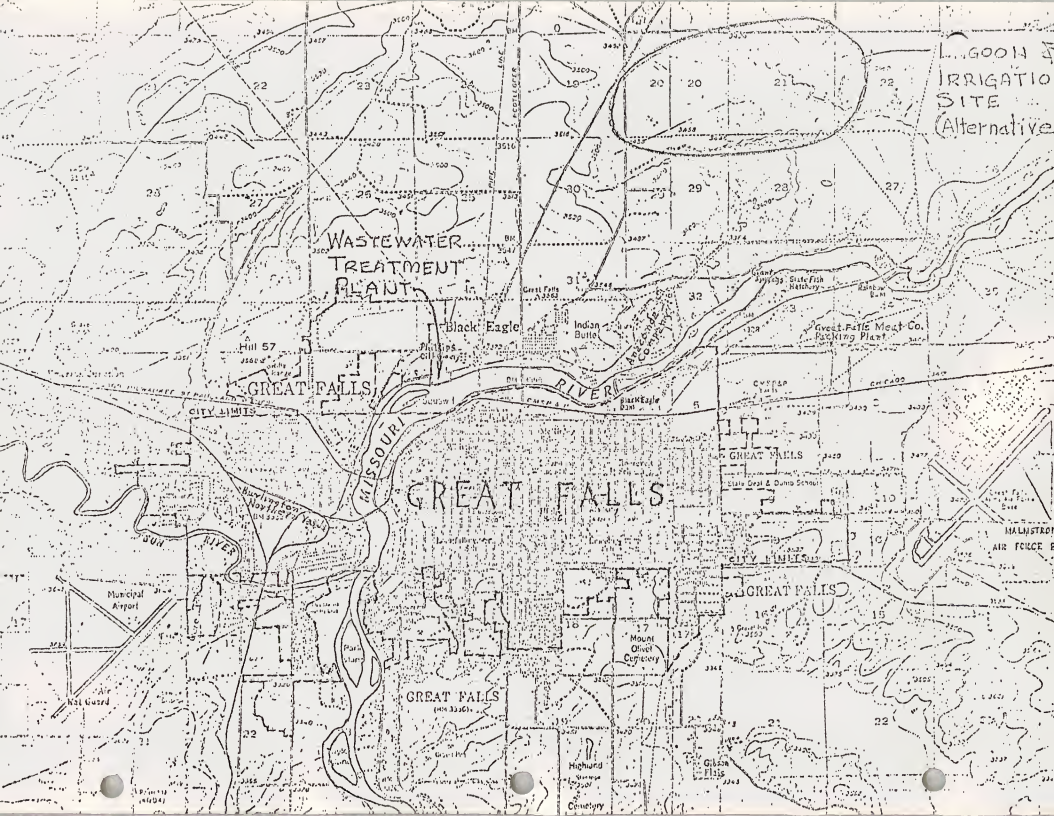
Environmental Impact

The proposed immediate project for providing secondary sewage treatment and improved primary treatment at Great Falls will improve water quality in the Missouri River. The improvements will be made on land already owned by the city and on land set aside for this purpose. There will be minimal impact created by the construction activities as no disturbance of the river bank is expected. This facility will be constructed at an elevation such that the plant can be operated even with a 100-year flood.

The present plant site, where the secondary facilities will be also is located in an industrial area and has operated without odor nuisance to down-wind neighbors. The proposed facility should also be able to operate under similar conditions and no odor nuisance is expected. Construction of the proposed facilities at this site should provide a lesser impact on the environment than construction at a new site. There are no known objections to the use of this site for sewage treatment purposes.

The existing sewage treatment facility is well operated and maintained. It is landscaped attractively and is an asset to the area.

Sanitary sewer and storm sewer construction as proposed in the Areawide Sanitary and Storm Sewerage Facilities Plan should create minimal disturbance of the environment. There will be traffic delays at the time the sewers are constructed, but streets should be returned to their original or better condition after the sewers are installed. Three stream crossings are proposed in the sewer construction and these should utilize construction practices such that there will be a minimum of disturbance of the streams.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Packing Plant
State Fish
Hatchery
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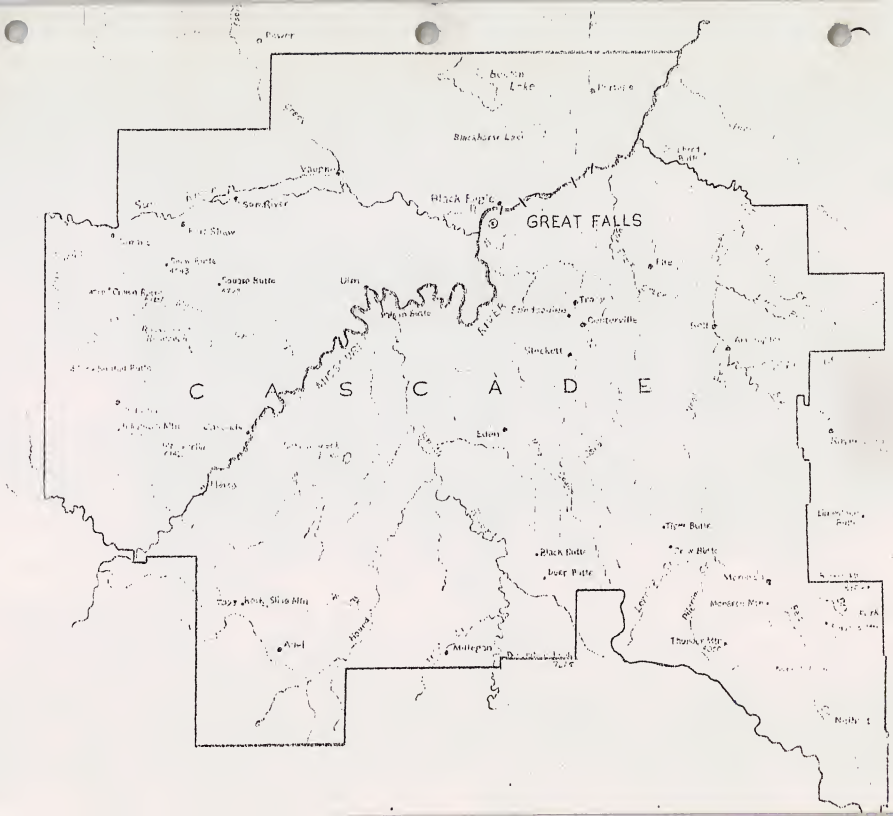
GREAT FALLS
C A S C A D E

MONTANA WATER POLLUTION CONTROL COUNCIL - SURFACE WATER USE CLASSIFICATIONS OF MONTANA, OCT. 5, 1967.

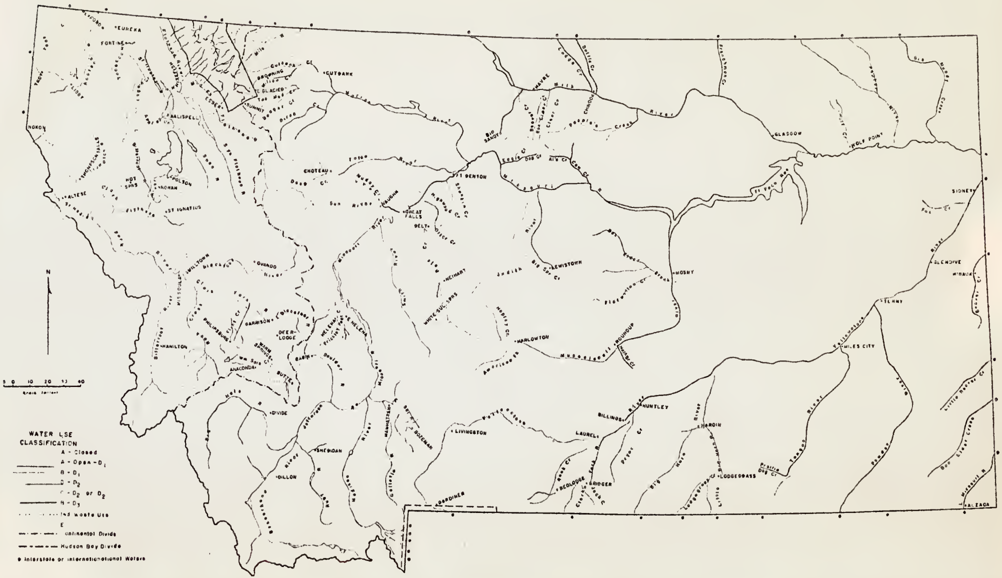

FIGURE 3